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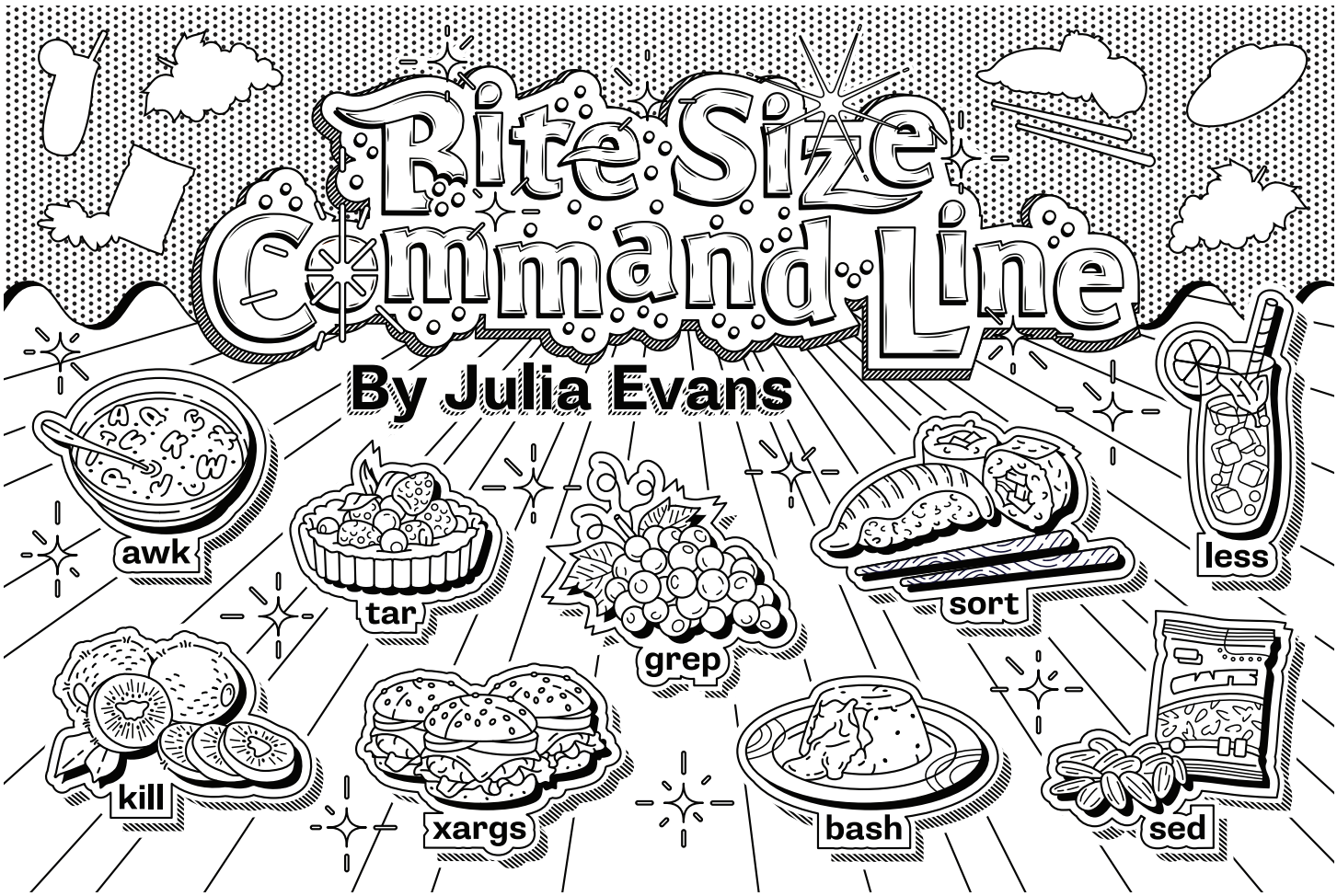
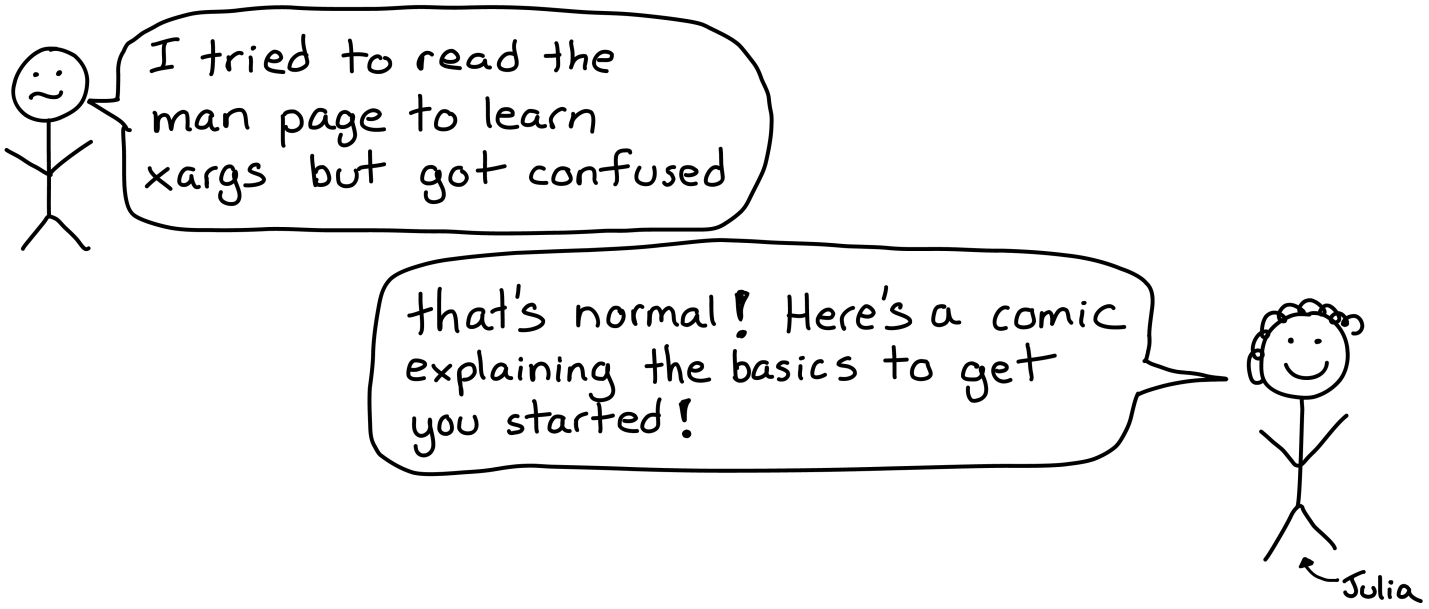


This zine explains some of the most useful Unix command line tools in 1 page each.




Even if you've used the command before, I might have a new trick or two for you ♥

# more useful tools

- make
- jq
- nohup
- disown
- cut/paste
- sponge
- xxd
- hexdump
- objdump
- strings
- screen
- tmux
- date
- entr
- seq
- join
- parallel:
  - GNU parallel
  - pigz/pixz
  - sort --parallel
- diff -U
- vipe
- imagemagick
- fish
- ranger
- chronic

# lsof



## lsof

stands for list open files


## what lsof tells you

for each open file:

- pid
- file type (regular? directory? FIFO? socket?)
- file descriptor (FD column)
- user
- filename / socket address

## -p PID

list the files PID has open

## lsof /some/dir

list just the open files in /some/dir

## -i

list open network sockets (sockets are files!)

examples:

```
-i -n -P   <- -n & -P mean "don't resolve host names/ports" (also -Pni)
-i :8080
-i TCP
-i -s TCP:LISTEN
```

## find deleted files

```
$ lsof | grep deleted
```

will show you deleted files!

You can recover open deleted files from

/proc/<pid>/fd/<fd>

(pid: process that opened the file)

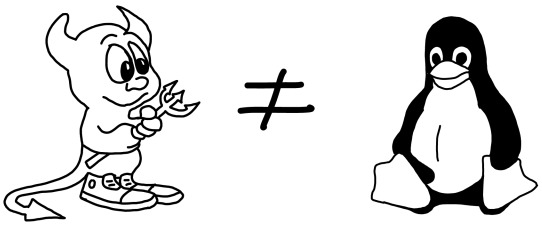
## netstat

another way to list open sockets on Linux is:

```
netstat -tunapl
        ↑
        tuna, please!
```

On Mac netstat has different args.

# ♥ Table of contents ♥



For almost all these tools, there are at least 2 versions:

① The BSD version (on BSDs & Mac OS)

② The GNU version (on Linux)

All of the examples in this zine were tested on Linux. Some things (like sed -i) are different on Mac. Be careful when writing cross-platform scripts!

You can install the GNU versions on Mac with `brew install coreutils`.

# cat & friends

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cat concatenates files

$ cat myfile.txt
prints contents of myfile.txt

$ cat *.txt
prints all .txt files put together!

you can use cat as an EXTREMELY BASIC text editor:

① Run $ cat > file.txt
② type the contents (don't make mistakes ☺)
③ press ctrl+d to finish

cat -n

prints out the file with line numbers!

```
1 Once upon a midnight..
2 Over many a quaint.
3 While I nodded, nearly
```

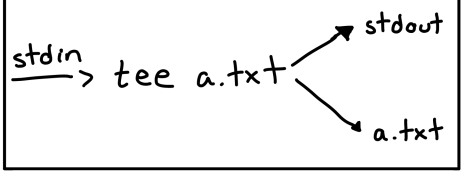
zcat

cats a gzipped file!

Actually just a 1-line shell script that runs `gzip -cd`, but easier to remember.

tee

`tee file.txt` will write its stdin to both stdout and file.txt




how to redirect to a file owned by root

$ sudo echo "hi" >> x.txt

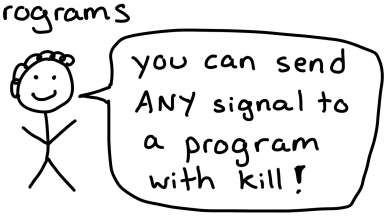
this will open x.txt as your user, not as root, so it fails!

$ echo "hi" | sudo tee -a x.txt
will open x.txt as root ☺

# kill

20

kill doesn't just kill programs




kill -SIGNAL PID

name or number

which signal kill sends

| | | name | num |
|---|---|---|---|
| kill | => | SIGTERM | 15 |
| kill -9 / kill -KILL | => | SIGKILL | 9 |
| kill -HUP | => | SIGHUP | 1 |
| kill -STOP | => | SIGSTOP | 19 |

kill -l
lists all signals

| | | | |
|---|---|---|---|
| 1 HUP | 2 INT | 3 QUIT | 4 ILL |
| 5 TRAP | 6 ABRT | 7 BUS | 8 FPE |
| 9 KILL | 10 USR1 | 11 SEGV | 12 USR2 |
| 13 PIPE | 14 ALRM | 15 TERM | 16 STKFLT |
| 17 CHLD | 18 CONT | 19 STOP | 20 TSTP |
| 21 TTIN | 22 TTOU | 23 URG | 24 XCPU |
| 25 XFSZ | 26 VTALRM | 27 PROF | 28 WINCH |
| 29 POLL | 30 PWR | 31 SYS | |

killall -SIGNAL NAME

signals all processes called NAME
for example

$ killall firefox

useful flags:

-w wait for all signaled processes to die

-i ask before signalling

## pgrep

prints PIDs of matching running programs

pgrep fire matches firefox, firebird

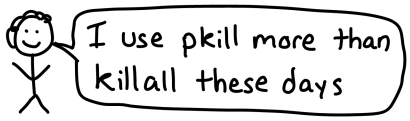
NOT bash firefox.sh

To search the whole command line (eg bash firefox.sh) use pgrep -f

## pkill

same as pgrep, but signals PIDs found. ex:

pkill -f firefox




# grep

5

grep lets you search files for text

$ grep bananas foo.txt

Here are some of my favourite grep command line arguments!

-i case insensitive

-A Show context for your search.
-B
-C

$ grep -A 3 foo

will show 3 lines of context after a match

-E aka egrep use if you want regexps like ".+" to work. otherwise you need to use ".\+"

-v invert match: find all lines that don't match

-l only show the filenames of the files that matched

-F aka fgrep don't treat the match string as a regex

eg $ grep -F ...

-r recursive! Search all the files in a directory.

-o only print the matching part of the line (not the whole line)

-a search binaries: treat binary data like it's text instead of ignoring it!

grep alternatives

ack ag ripgrep

(better for searching code!)

# find



find searches a directory for files

```
find /tmp -type d -print
```

/tmp: directory to search; -type d: which files; -print: action to do with the files


## -name/-iname

case insensitive

the filename! eg

```
-name '*.txt'
```

## -type [TYPE]

f: regular file
d: directory
l: symlink
+ more!

## -path /-ipath

search the full path!

```
-path '/home/*/*.go'
```

## -maxdepth NUM

only descend NUM levels when searching a directory

## -sizeO

find empty files!
Useful to find files you created by accident

## -printO

print null-separated filenames
Use with xargs -0!

## locate

The locate command searches a database of every file on your system.

good: faster than find
bad: can get out of date

$sudo updatedb
updates the database

## -exec COMMAND

action: run COMMAND on every file found

## -delete

action: delete all files found

# less



## less is a pager

that means it lets you view (not edit) text files or piped in text

man uses your pager (usually less) to display man pages

## many vim shortcuts work in less

| | |
|---|---|
| / | search |
| n/N | next / prev match |
| j/k | down/up a line |
| m/' | mark/return to line |
| g/G | beginning/end of file |

(gg in vim)

## less -r

displays bash escape codes as colours

try ls --color | less -r

| with -r | without -r |
|---|---|
| a.txt | a.txt |
| a.txt.gz (red, bold) | ESC[0m ESC [01;31m a.txt.gz ESC[0m |

ugh

## q

quit

## V ← lowercase

edit file in your $EDITOR

arrow keys, Home/End, PgUp, PgDn work in less

## F

press F to keep reading from the file as it's updated (like tail -f)

press ctrl+C to stop reading updates

## +

+ runs a command when less starts

| | |
|---|---|
| less +F | : follow updates |
| less +G | : start at end of file |
| less +20% | : start 20% into file |
| less +/foo | : search for 'foo' right away |

# head & tail



## head

shows you the first 10 lines of a file

if you pipe a program's output to head, the program will stop after printing 10 lines (it gets sent SIGPIPE)

## tail

tail shows the last 10 lines!

`tail -f FILE` will follow:

print any new lines added to the end of FILE. Super useful for log files!

## -n NUM

-n NUM (either head or tail) will change the # lines shown

`head -n -NUM` } show all but the last / first NUM lines
`tail -n +NUM` }

## -c NUM

show the first/last NUM bytes of the file

```
head -c 1K
```

will show the first 1024 bytes

## tail --retry

keep trying to open file if it's inaccesible

## tail --pid PID

stop when process PID stops running (with -f)

## tail --follow=name

Usually tail -f will follow a file descriptor.

tail --follow=name FILENAME will keep following the same filename, eg if the file descriptor is rotated.

# xargs



xargs takes whitespace separated strings from stdin and converts them into command-line arguments

```
$ echo "/home /tmp" | xargs ls
```

will run

```
ls /home /tmp
```

this is useful when you want to run the same command on a list of files!

- → delete (xargs rm)
- → combine (xargs cat)
- → search (xargs grep)
- → replace (xargs sed)

how to replace "foo" with "bar" in all .txt files:

```
find . -name '*.txt' |
xargs sed -i s/foo/bar/g
```

how to lint every Python file in your Git repo:

```
git ls-files | grep .py |
  xargs pep8
```

if there are spaces in your filenames "my day.txt" xargs will think it's 2 files "my" and "day.txt"

fix it like this:

```
find . -print0 |
  xargs -0 COMMAND
```

more useful xargs options

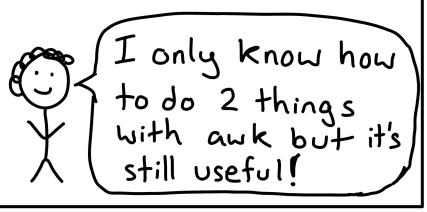
`-n 1` (max-args) makes xargs run a separate process for each input.

`-P` (capital P, max-procs) is the max number of parallel processes xargs will start

# awk



awk is a tiny programming language for manipulating columns of data




basic awk program structure

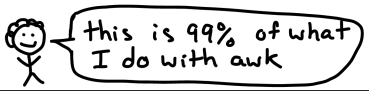
```
BEGIN { ... }
CONDITION {action}
CONDITION {action}
END {...}
```

do action on lines matching CONDITION

extract a column of text with awk

```
awk -F, '{print $5}'
```

column separator | single quotes! | print the 5th column




SO MANY unix commands print columns of text (ps! ls!)

so being able to get the column you want with awk is GREAT

awk program example:
sum the numbers in the 3rd column

```
{s += $3};
END {print s}'
```

action

at the end, print the sum!

awk program example:
print every line over 80 characters

```
length($0) > 80
```

condition

(there's an implicit {print} as the action)

# misc commands ♥



## rlwrap

adds history & ctrl support to REPLs that don't already have them

(rl stands for readline)

```
$ rlwrap python
```

## watch

rerun a command every 2 seconds

## pv

"pipe viewer", gives you stats on data going through a pipe

## file

figures out what kind of file (png? pdf?) a file is

## cal

a tiny calendar ♡

## ts

add a timestamp in front of every input line

## ncdu

figure out what's using all your disk space

## diff

diff 2 files. Run with '-U 8' for context.

## comm

find lines 2 sorted files have in common

## column

format input into columns

## xsel / xclip

copy/paste from system clipboard.
(pbcopy/pbpaste on Mac)

# sort & uniq



## sort sorts its input

```
$ sort names.txt
```

the default sort is alphabetical.

## sort -n

numeric sort

| 'sort' order | 'sort -n' order |
|---|---|
| 12 | 12 |
| 15000 | 48 |
| 48 | 96 |
| 6020 | 6020 |
| 96 | 15000 |

## sort -h: human sort

| 'sort -n' order | 'sort -h' order |
|---|---|
| 15G | 45K |
| 30M | 30M |
| 45K | 15G |
| 200G | 200G |

useful example:

```
du -sh * | sort -h
```

## uniq removes duplicates

```
a
b
b   =>   a, b, a   (notice there are still 2 'a's! uniq only uniquifies adjacent matching lines)
a        c
c
c
```

## sort + uniq = ♥

Pipe something to 'sort | uniq' and you'll get a deduplicated list of lines! {sort -u} does the same thing.

```
b
a | sort -u =>  a
b               b
a
```

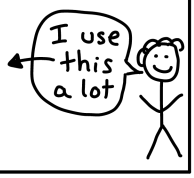
or sort | uniq

## uniq -c

counts each line it saw.

Recipe: get the top 10 most common lines in a file:

```
$ sort foo.txt
  | uniq -c
  | sort -n
  | tail -n 10
```




# sed

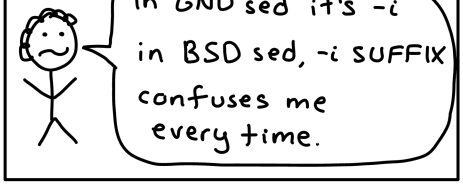


sed is most often used for replacing text in a file

```
$ sed s/cat/dog/g file.txt
```

can be a regular expression

change a file in place with {-i}




some more sed incantations...

## sed -n 12 p

print 12th line

{-n} suppresses output so only what you print with 'p' gets printed

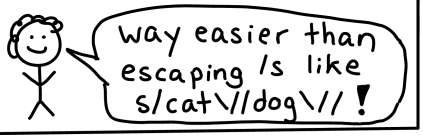
## sed 5d

delete 5th line

## sed s+cat/+dog/+

('+' can be any character)

use + as a regex delimeter




## sed G

double space a file (good for long error lines)

## sed /cat/d

delete lines matching /cat/

## sed '/cat/a dog'

append 'dog' after lines containing 'cat'

## sed -n 5,30 p

print lines 5-30

## sed -n s/cat/dog/p

only print changed lines

## sed 'i17 panda'

insert "panda" on line 17

# bash tricks

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## ★ ctrl + r ★

search your history!

I use this ♥ constantly ♥ to rerun commands

## ★ magical braces ★

$ convert file.{jpg,png}

expands to

$ convert file.jpg file.png

{1..5} expands to 1 2 3 4 5

(for i in {1..100} ...)

## !!

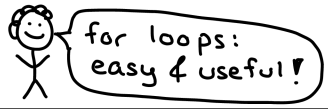
expands to the last command run

$ sudo !!

commands that start with a space don't go in your history. good if there's a 🔒 password 🔒

## loops

```
for i in *.png
do
  convert $i $i.jpg
done
```




## $( )

gives the output of a command

$ touch file-$(date -I)

create a file named file-2018-05-25

## more keyboard shortcuts

| | |
|---|---|
| ctrl a | beginning of line |
| ctrl+e | end of line |
| ctrl+l | clear the screen |

+ lots more emacs shortcuts too!

# top

15

## top

a live-updating summary of the top users of your system's resources


let's explain some numbers in top!

## load average

3 numbers that roughly reflect demand for your CPUs on the system in the last 1, 5, and 15 minutes

if it's higher than the # of CPUs you have, that's often bad

## memory

4 numbers:

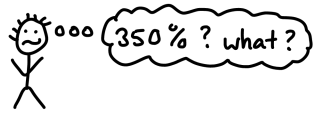
total / free / used / cached

One perhaps unexpected thing: total is not free + used!

total = free + used + cached

filesystem cache

## % CPU




this column is given as % of a single core. If you have 4 cores, this can go up to 400%!

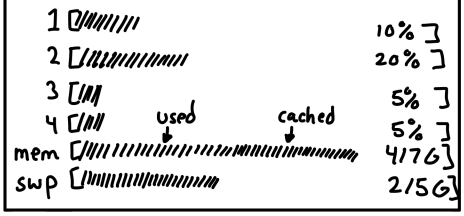
## RES

this column is the "resident set size" aka how much RAM your process is using.

SHR is how much of the RES is shared with other processes

## htop

a prettier & more interactive version of top ★



# ps



## ps

ps shows which processes are running

I usually run ps like this:

```
$ ps aux
```

u means include username column

a+x together show all process

(ps -ef works too)

## w

is for wide. ps auxwww will show all the command line args for each process

## e

is for environment. ps auxe will show the environment vars!

## wchan

you can choose which columns to show with ps (ps -eo ...)

One cool column is 'wchan' which tells you the name of the kernel function if the process is sleeping

try it:

ps -eo user,pid,wchan,cmd

## ★ process state ★

Here's what the letters in ps's STATE column mean:

- R: running
- S/D: asleep
- Z: zombie
- l: multithreaded
- +: in the foreground

## f

is for "forest" 🌳. ps auxf will show you an ASCII art process tree!

pstree can display a process tree too

## ps has 3 different sets of command line arguments 💔

1. UNIX (1 dash)
2. BSD (no dash)
3. GNU (2 dashes)

you can write monstrositres like:

```
$ ps f -f
```

f: forest (BSD)

-f: full format (UNIX)

# more bash tricks



## cd -

changes to the directory you were last in

pushd & popd let you keep a stack

## ctrl+z

suspends (SIGTSTP) the running program

## bg

starts suspended program & backgrounds it (use after ctrl+z)

## fg

brings backgrounded/suspended program to the foreground

## ♡ shellcheck ♡

shell script linter! helps spot common mistakes.

## <( )

process substitution

treat process output like a file (no more temp files!)

eg:

```
$ diff <(ls) <(ls -a)
```

## fc

"fix command"

open the last command you ran in an editor

then run the edited version

## type

tells you if something is a builtin, program, or alias

try running type on

{time} [ping] {pushd}

(they're all different types)

# disk usage



## du

tells you how much disk space files / directories take up

-s summary: total size of all files in a directory

-h human readable sizes

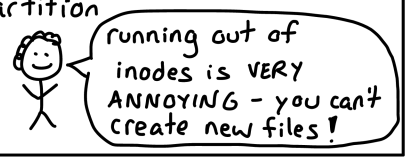
## *df*

tells you how much free space each partition has. -h for human-readable sizes

| Filesystem | Size | Used | Avail | Use% | Mounted on |
|---|---|---|---|---|---|
| /dev/sda3 | 18G | G | 2.5G | 86% | / |
| udev | 483M | 4.0K | 483M | 1% | /dev |
| tmpfs | 99M | 1.4M | 97M | 2% | /run |
| /dev/sda4 | 167G | 157G | 9.9G | 95% | /home |

## df -i

instead of % disk free, report how many inodes are used/free on each partition




## ncdu

see what's using disk space navigate with arrow keys

```
17.5 GiB [#####] /music
 3.2 GiB [##   ] /pictures
 5.7 MiB [     ] /text
 2.0 MiB [     ] file.pdf
```

## iostat

get statistics about disk reads / writes

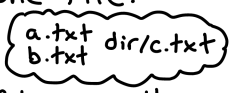
interval to report at

```
# iostat 5
Device:  kB_read/s  kB_wrtn/s
sda        2190.21     652.87
sdb           6.00       0.00
```

# tar



The .tar file format combines many files into one file.

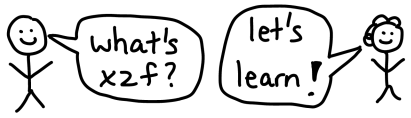



.tar files aren't compressed by themselves. Usually you gzip them: .tar.gz or .tgz!

Usually when you use the 'tar' command, you'll run some incantation

To unpack a tar.gz, use:

```
tar -xzf file.tar.gz
```




-x is for extract

into the current directory by default (change with -C)

-c is for create

makes a new tar file!

-t is for list

lists the contents of a tar archive

-f is for file

which tar file to create or unpack

tar can compress / decompress

-z gzip format (.gz)

-j bzip2 format (.bz2)

-J xz format (.xz)

& more! see the man page ☺

putting it together

list contents of a .tar.bz2:

```
$ tar -tjvf file.tar.bz2
```

verbose

create a .tar.gz

```
$ tar -czf file.tar.gz dir/
```

files to go in the archive